2012 Behavioral Health and Performance Standing Review Panel

Status Review for:

The Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload and The Risk of Adverse Behavioral Conditions and Psychiatric Disorders

Comments to the Human Research Program, Chief Scientist

I. Overview

The 2012 Behavioral Health and Performance (BHP) Standing Review Panel (from here on referred to as the SRP) met for a site visit in Houston, TX on December 11 - 12, 2012 to review the Research Plan for the Team Risk (Risk of Performance Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team) in the Human Research Program's (HRP) Integrated Research Plan (IRP Rev. D) and to receive a status update on the Sleep and Bmed Risks (Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload and the Risk of Adverse Behavioral Conditions and Psychiatric Disorders).

The SRP thought that the presentations by Lauren Leveton, Ph.D. (BHP Element Scientist) and Alexandra Whitmire, Ph.D. (Sleep Risk Lead) were very well done and very informative concerning activities in their area. The SRP sympathizes with the BHP Element because the need to conduct research that is minimally intrusive on crew time poses a real limitation on what can be done.

Based on the presentations and the discussion during the meeting, the SRP would like to relay the following information to Craig Kundrot, Ph.D. the HRP Chief Scientist (Acting).

II. Comments to the BHP Element Response to the 2011 SRP Report

- The SRP finds the BHP Element's response to the 2011 SRP Report recommendations to be generally positive. Specific comments:
    - Asthenia:
        - The SRP thinks that the literature review appears to have produced a good picture of why this "syndrome" is not legitimized as such by the Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Classification of Diseases (ICD), and that it is more appropriate to consider and deal with the individual symptoms that have (inconsistently) been described as its components.
        - The SRP supports further research on the specific symptoms aboard the International Space Station (ISS) and appropriate analog environments, looking at the impact of possible symptoms in addition to cognitive decrements (BMed Gap 3).
    - Resilience and Growth
        - The SRP continues to support adding research to enhance to the highest practical level the behavioral health and positive psychological conditions for

astronauts as one of the foci of the research program (e.g., the studies addressing Gap BMed1, Team Gap 2 and Team Gap 8, Meaningful Work Panel, Net Habitable Volume Working Group). This would broaden the benefits of the traditional concern with pathogenic (psychological decrement- or problem-causing) aspects, such as maximizing risk reduction and the emphasis on countermeasures and mitigation. The two orientations are mutually reinforcing rather than mutually exclusive, and the boundary between them is fuzzy, but adding the positive viewpoint will improve both performance and psychological health.

- The SRP thinks that the overview and summary of the status of the various BHP Risks was very useful. The BHP Element has accomplished a lot, as noted in the "Portfolio Status" presentation and is listed as "Areas Well Covered." At the same time, the long list of "Areas *Not* Well Covered" reflects both the restricted resources available to the BHP Element and the complexity and difficulty of the whole area of behavioral health and performance. The SRP urges the BHP Element to give high priority to the validation of measures (cognitive and otherwise) against operational performance, which is equally critical for dealing with gaps within each risk (e.g., Team Gap 2).

III. Comments for the Sleep Risk Status Review

- As in 2011, the SRP thinks that the Sleep Risk area is better developed compared to the other two risks (Team and BMED), perhaps because the problems are more easily quantified and more analog data are available from a long list of terrestrial Isolated, Confined and Extreme (ICE) studies. Considerable progress has been made since the first 2009 BHP SRP meeting.
- The SRP recommends consideration of an additional sleep gap: A consideration of posture effects as a contributor to the sleep difficulties commonly found in the space environment (i.e., research has shown that recline angle, which affects baroreceptor activation and other physiological indices, modulates CNS arousal).
- Gaps Sleep1 and Sleep4: The SRP thinks that the BHP Element should work with other groups (for example, the military) that conduct sleep research, to identify what are the best tests and then assess them for generalizability. The BHP Element could conserve its resources by not duplicating current work being done in this area (e.g., with WinSCAT).
- Gaps Sleep2, Sleep4, and Sleep6: The SRP does not see a strong correlation between what happens on ground and during spaceflight with respect to sleep. Studies show that people who do not have any sleep problems on Earth usually start having sleep problems during spaceflight. How may sleep loss and/or medications affect performance during spaceflight missions? Cognitive changes are not the only kind that can result from sleep loss or medication; for example, changes in perceptual-motor behavior (reaction time, motor coordination) and the affect (e.g., increased irritability) sleep disturbances can have on individual and group performance. Data from terrestrial environments may not be automatically generalizable to effects during spaceflight. Areas in which this is particularly the case includes attempts to generalize individual susceptibility to fatigue-induced performance decrements or individual susceptibility to sleep difficulties.

- Gap Sleep5: The SRP thinks that the inclusion of ground control staff in some research is commendable, and should probably be extended to other studies in the future (e.g., Gaps Sleep3 and Sleep4).
- Gaps Sleep6 and Sleep10: The SRP thinks that the question of why astronauts report sleep reduction and take sleep-promoting medications should be answered and should be extended to the training and pre-flight periods. For example, does the pre-launch period impose excessive fatigue due to task and travel overload? Does the microgravity environment result in lower need for sleep?

IV. Comments for the Bmed Risk Status Review

- The list of proposed gaps in this area shows a good balance of recognizing both positive and negative impacts of space exploration.
- The SRP thinks that there is a missing gap under this risk with respect to recreational activities. Studies are needed to determine what recreational activities the astronauts prefer during their downtime in space, and how these can be made attractive and stress-reducing.
- The SRP suggests that the BHP Element keep in mind that journaling is not always a good activity. For example, individuals with obsessive-compulsive tendencies should not journal, because studies show that it can make them more depressed. This recommendation is also relevant to risk areas supporting journaling studies.
- Optical computer recognition task (Optical Computer Recognition of Stress, Affect and Fatigue During Performance in Spaceflight, PI: David Dinges, Ph.D.): The SRP notes that this research is expected to conclude at the end of 2016, by which time it will have been continuing for over 15 years (its first funding began in 2000). Although recognition and prevention of adverse stress impacts on astronauts are obviously crucial, it is not clear to the SRP that this prolonged set of studies provides sufficient added value to other, already validated, measures (e.g., self-reports, peer and leader observations, physiological indices) to justify it. Specifically, a concern was raised that environmental factors which may distort the physical characteristics of the face may negatively impact the reliability of measures based on optical computer recognition.
- Family support is obviously an important NASA function, and as reported, existing support services are in place. The SRP appreciates the BHP Element's agreement that more systematic knowledge is needed and the use of more advanced technology should be incorporated, and hopes that specific plans will be developed and activated in the near future (Gap BMed8). Longer-duration missions will likely increase the problems related to families and therefore to crew-family interactions; and the latter are equally likely to affect crew morale, behavioral health, and performance.

V. 2012 Behavioral Health and Performance SRP Status Review: Statement of Task for the Risk of Adverse Behavioral Conditions and Psychiatric Disorders and the Risk of Performance Errors Due to Fatigue Resulting from Sleep Loss, Circadian Desynchronization, Extended Wakefulness, and Work Overload

The 2012 Behavioral Health and Performance (BHP) Standing Review Panel (SRP) will participate in a Status Review that will occur via a site visit meeting with the Human Research Program (HRP) Chief Scientist, Deputy Chief Scientist and members of the BHP Element. The purpose of this review is for the SRP to:

1. Receive an update by the HRP Chief Scientist or Deputy Chief Scientist on the status of NASA's current and future exploration plans and the impact these will have on the HRP.

2. Receive an update on any changes within the HRP (for example, each of the Elements rewriting their gaps) since the 2011 SRP meeting.

3. Receive an update by the Element or Project Scientist(s) on progress since the 2011 SRP meeting.

4. Participate in a discussion with the HRP Chief Scientist, Deputy Chief Scientist, and the BHP Element regarding possible topics to be addressed at the next SRP meeting.

The 2012 BHP SRP is not required to produce a report from this status review, but the HRP Chief Scientist welcomes any written comments from the SRP within 30 days of the 2012 update. Any comments that the 2012 BHP SRP provides to the HRP Chief Scientist will be made available to the public on the Human Research Roadmap website (http://humanresearchroadmap.nasa.gov/).

VI. 2012 Behavioral Health and Performance Standing Review Panel Roster

Panel Chair:

Peter Suedfeld, Ph.D.
University of British Columbia
Department of Psychology
2136 West Mall, UBC
Vancouver, BC V6T 1Z4
CANADA
Ph: 604-822-5713
Email: psuedfeld@psych.ubc.ca

Panel Members:

Richard Bootzin, Ph.D.
University of Arizona
Department of Psychology
1503 E. University
Tucson, AZ 85721-0068
Ph: 520-621-5705
Email: bootzin@u.arizona.edu

John Caldwell, Ph.D.
411 Hobron Lane, Apt. 3411
Honolulu, HI 96815
Ph: 808-255-5554
Email: airspeed669@hotmail.com

Thomas Joiner, Ph.D.
Florida State University
Department of Psychology
B436 PDB
Tallahassee, FL 32306-4301
Ph: 850-644-1454
Email: joiner@psy.fsu.edu

Gloria Leon, Ph.D.
University of Minnesota
Department of Psychology
Elliott Hall
75 East River Road
Minneapolis, MN 55455
Ph: 612-625-9325
Email: leonx003@umn.edu

Martin Paulus, Ph.D.
University of California, San Diego
Department of Psychiatry
8939 Villa La Jolla Drive, Suite 200
LaJolla, CA 92037-0985
Ph: 858-534-9444
Email: mpaulus@ucsd.edu